



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

years of school-life; and his biographer expressly says that older pupils who came to him for instruction went away disappointed. In short, his method, as modified and applied by his successors, has proved a useful auxiliary in early childhood to the regular system of education; but that is all that can be claimed for it. His love of children, however, and his ardent interest in the poor and ignorant, with his lifelong efforts for their improvement and elevation, are worthy of all praise. It is these noble qualities of the man that give the chief interest to his biography; and there is not a teacher anywhere that cannot learn something in this respect by a perusal of this work.

*The Electric Motor and its Applications.* By MARTIN and WETZLER. New York, W. J. Johnston. 4°. \$3.

THIS is a revised and enlarged edition of a work first published about two years ago, and reviewed in these columns at that time. While considerable space is given to the theoretical and historical views of the electric motor, the book is mainly devoted to its more modern development and application. The present work is in great part a reprint of the first edition, to which have been added nearly a hundred pages of new matter, thus giving a complete review of the subject treated down to the end of 1888. The new chapters contain a description of all the noteworthy motors and electric-railway systems introduced since the publication of the earlier edition, as well as a discussion of alternating-current and thermomagnetic motors. Thus the new portion of the book not only comprises instances in which electric power has advanced from the experimental stage to that of successful practice, but also casts a glance at the results which the future may be expected to yield. The book is worthy a place in the library of every electrician, and to the general reader it is not without interest.

*Examination of Water for Sanitary and Technical Purposes.* By HENRY LEFFMANN and WILLIAM BEAM. Philadelphia, Blakiston. \$1.25.

THIS is an admirable little manual of one hundred and six pages, giving in clear and concise language the most trustworthy and practicable processes for the examination of water. The soap-test for the determination of the hardness of water, which has been so long in use by chemists, has been abandoned by the authors as inaccurate, and in its place they have recommended the method devised by Hehner, in which sodium carbonate and sulphuric acid are employed. For the determination of nitrate and nitrites the calorimetric tests are advised to the exclusion of the more troublesome and uncertain processes heretofore in use. In order to have the advanced nomenclature and notation of the present time kept constantly in mind, a set of labels for the re-agents has been provided, and is furnished with the book. Among the special features of this volume are the chapters describing the action of water on lead, and the technical application to be deduced from an analysis of a given specimen of water, its action on boilers, etc.

*The Bacteria in Asiatic Cholera.* By E. KLEIN, M.D. London and New York, Macmillan. 16°. \$1.25.

THIS volume is a reprint of a series of articles published in the *Practitioner* in 1886 and 1887, together with a number of contributions which have since been made to the knowledge of the comma bacilli of Koch. Klein may be regarded as the most pronounced opponent of Koch's theory that the comma bacillus is the cause of Asiatic cholera. That he is, however, not the only one, is shown by the statement in the volume before us, that Baumgarten, Pettenkofer, and Emmerich in Germany; Roy, Sherrington, and Brown in England; and Shakspeare in America, — hold the same opinion as Klein. While denying the causal relation between the comma bacillus of Koch and *Cholera Asiatica*, Klein, nevertheless, recognizes its diagnostic importance. On this point he says he agrees to the proposition, that, if in any case of diarrhoea the choleraic comma bacilli can be shown both by the microscope and by culture-experiments to exist, then the suspicion that it may be a case of Asiatic cholera is quite justified: for if it should be found, that, in a locality which is in communication by sea or land with an infected country, one or more suspicious cases of diarrhoea had occurred, the demonstrations by culture-experiments of the

presence in the intestinal discharges of the choleraic comma bacilli would fully justify us in regarding such cases with grave suspicion as being probably, though not necessarily, choleraic. At all events, sanitary officers, for the sake of the public weal, would be justified in treating these cases as cases of cholera, and in taking measures of isolation and disinfection. It is impossible at the present time to decide between such men as Koch and Klein and their adherents. Each day new facts are being discovered, and views which seemed to rest on a firm foundation have had to be abandoned in the light of newly discovered evidence. Klein shows very plainly that many of Koch's earlier statements in reference to the presence or absence of the comma bacillus have already required great modifications. Fortunate it is that all are agreed, that, whether Koch's comma bacillus cause the Asiatic cholera or not, its presence is sufficient evidence of the existence of that disease to demand of sanitary officials the most rigid isolation of the suspicious case, and the most thorough disinfection of his clothing and surroundings.

*First Book of Nature.* By JAMES E. TALMAGE. Salt Lake City, Utah, Contributor Company.

THIS little book is designed to assist in the elementary study of the simplest objects of nature, — such as all people have more or less necessity of dealing with, — and as a help to mothers, and teachers in primary schools, will prove of great assistance. It deals with the simplest facts in the animal, vegetable, and mineral kingdoms, and such facts as every one ought to know. The ignorance of many of these simple facts on the part of many persons who are presumably educated is both lamentable and ridiculous. In a legal trial which occurred some time since, in which complaint was made that a crowing rooster was a nuisance, and kept in violation of an ordinance prohibiting the keeping of noisy animals in the city, it was maintained that an action could not lie, because a rooster was not an animal. Had those who held this opinion read this "First Book of Nature," such a blunder could not have been made.

#### AMONG THE PUBLISHERS.

"THE Voltaic Accumulator," an elementary treatise by Emile Reynier, translated from the French by J. A. Berly, C.E. (New York, E. & F. N. Spon), describes in a didactic manner the whole of the practical and scientific acquisitions made in the domain of the voltaic accumulator from Planté to our days. It brings together, summarizes, explains, and classifies the notions, theories, and inventions relating to secondary currents, and reviews the principal applications of the latter.

"Eight Hundred Miles in an Ambulance" is the title of a little volume of papers republished from *Lippincott's Magazine*, and describing the adventures of Mrs. Laura Winthrop Johnson in a journey across the Western plains with an army paymaster.

— Mr. B. P. Shillaber (Mrs. Partington) is writing his reminiscences of the last half-century.

— P. Blakiston, Son, & Co., medical and scientific publishers, booksellers, and importers, 1012 Walnut Street, Philadelphia, have just published the "Medical Directory of Philadelphia and Camden, 1889," containing lists of physicians of all schools of practice, dentists, druggists, veterinarians, and chemists, with information concerning medical societies, colleges, and associations, hospitals, asylums, charities, etc.; and "A Manual of Chemistry," for the use of medical students; by Brandreth Symonds, A.M., M.D., assistant physician Roosevelt Hospital, out-patient department, and attending physician Northwestern Dispensary, New York.

— Robert Carter & Brothers will publish, by arrangement with the author and English publisher, the autobiography of John G. Paton, missionary to the New Hebrides.

— John Wiley & Sons announce "Philosophy of the Steam-Engine Developed," by Professor Robert H. Thurston; "Composition, Digestibility, and Nutritive Value of Food," by Professor H. A. Mott; and "General Motions of the Atmosphere, Cyclones, Tornadoes, Water-Spouts, Hail-Stones, etc.," by Professor William Ferrel.

— *The American Garden* of New York has taken another step forward by the incorporation of its business under the title of "The Garden Publishing Company, Limited." The management goes on largely in the same hands, but with the more intimate connection of several able men, who really have had much to do in making *The American Garden* what it has become; and, with increased means, the editor expects to more rapidly improve the magazine, and increase the business in proper lines. The organization of the new company stands as follows: Lawson Valentine, president; Charles Barnard, vice-president; L. H. Bailey; John DeWolf, secretary; Edgar H. Libby, treasurer. Mr. Valentine is also president of the Christian Union Company; a prominent member of the great publishing-house of Houghton, Mifflin, & Co., owner of Houghton Farm; and president of the Lawson Valentine Company, makers of fine varnishes. Mr. Barnard is connected with The Century Company, author of that wonderfully successful

drama, "The County Fair," author of numerous successful books on technical subjects, and a practical horticulturist as well. Professor Bailey is head of the new horticultural department at Cornell University, and a thoroughly practical man of wide experience. Mr. DeWolf is a professional landscape-gardener, for several years head of the art department and assistant editor of *The American Garden*. Mr. Libby has been the editor and publisher for four years and a half, and has pushed the business with hard work and exceptional skill.

— The editorial management of the *North American Review* is at present in the hands of Mr. William H. Rideing.

— Macmillan & Co. will publish shortly an appendix to Grove's "Dictionary of Music and Musicians," which completes the fourth and concluding volume of the work. A full index to the work is in preparation, which will be published later in a separate volume.

**Publications received at Editor's Office,  
May 27-June 1.**

- DAWSON, G. M. Report on an Exploration in the Yukon District, N.W.T., and Adjacent Northern Portion of British Columbia, 1887. Montreal, Dawson Bros. 277 p. 8°. 30 cents.
- EMERSON, R. W. The Fortune of the Republic and other American Addresses. (Riverside Literature Series, No. 42.) Boston and New York, Houghton, Mifflin, & Co. 109 p. 16°. 15 cents.
- GRIMES, J. S. Geonomy: Creation of the Continents by the Ocean Currents. And Kosmo-nomia: the Growth of Worlds and the Cause of Gravitation. Philadelphia, Lippincott. 139 p. 16°. 50 cents.
- KELLOGG, M. M. Tullii Ciceronis Brutus de Claris Oratoribus. Boston and London, Ginn. 196 p. 12°.
- KING, C. "Laramie," or, The Queen of Bedlam. A Story of the Sioux War of 1876. Philadelphia, Lippincott. 277 p. 12°. \$1.
- SANBORN, J. W. Go to the Ant and learn Many Wonderful Things. Cincinnati, Cranston & Stowe; New York, Hunt & Eaton. 119 p. 12°.
- THOMSON, J. Travels in the Atlas and Southern Morocco. New York, Longmans, Green, & Co. 488 p. 12°. \$3.
- VIGNOLES, O. J. Life of Charles Blacker Vignoles. London and New York, Longmans, Green, & Co. 407 p. 8°. \$5.

**Old and Rare Books.**

One Million Magazines. Back numbers, vols. and sets—old and new, Foreign and American. CATALOGUE UPON APPLICATION.

**A. S. CLARK,**  
34 Park Row, New York City.

**B**ACK NUMBERS and complete sets of leading Magazines. Rates low. AM. MAG. EXCHANGE, Schoharie, N.Y.

**H. WILLIAMS,**  
Dealer in Old Magazines, Reviews, &c. Scientific periodicals a specialty. 39 Macdougall St., N.Y.

**Readers of Science**

*Corresponding with or visiting Advertisers will confer a great favor by mentioning the paper.*

*Correspondence solicited with parties seeking publishers for scientific books.*

**N. D. C. HODGES,**  
Publisher of Science,  
47 Lafayette Place,  
New York.

**IN PRESS FOR EARLY PUBLICATION.**

**GEOLOGY AT A GLANCE.**

**Ives Strata Map of the United States,**

**In which the Architecture of the Earth's Crust is Graphically Exhibited, Illustrating Fundamental Facts alike of**

**STRUCTURAL GEOLOGY AND PHYSICAL GEOGRAPHY.**

The Strata Map is a device for the more efficient teaching of Physical Geography and Elementary Geology in Schools. It consists of a series of Superimposed Maps, of DIFFERENT COLORS, representing the several geological formations of the district, enclosed in a frame, the whole hinged to ad-

mit of examination in detail. By its means *superposition, denudation, and outcrop of strata* are graphically exhibited, with the phenomena of *escarpments, outliers, intiers, dip, strike, conformability, &c.*, and the Cards may be bent to show *synclinal or anticlinal folds*.

**OPINIONS OF EMINENT GEOLOGISTS.**

- Yale University. Professor James D. Dana.  
"Well fitted for the use of instruction in the science."
- Professor Addison E. Verrill.  
"It will be of very great advantage in the teaching of geology."
- Harvard University. Professor N. S. Shaler.  
"An extremely useful adjunct to our means of illustration."
- Johns Hopkins University. President D. C. Gilman.  
"Wherever American geology is taught your map should be a part of the apparatus."
- Pennsylvania University. Professor Geo. A. Koenig.  
"The map will be of special use in schools, which can only devote a short time to the study of Geology."
- Michigan University. Professor Alexander Winchell.  
"It seems to me that the device will commend the study of Geology to many persons who might otherwise regard the subject as difficult and uninviting. The work prepared by Mr. Ives ought to be used extensively in American schools."
- Cornell University. Professor H. Shaler Williams.  
"A valuable aid to teachers of geology as a means of graphically representing the grand facts of stratigraphy in the Eastern United States."
- Columbia College, New York. Professor J. S. Newberry.  
"A valuable aid in teaching geology, giving as it does to the student a clear idea of the superposition of the different geological systems at a glance."
- Dartmouth College, Hanover, N. H. Professor C. H. Hitchcock.  
"Am satisfied that its use will greatly assist students to understand the geological structure of the country."

- Academy of Natural Sciences of Philadelphia. Professor Angelo Heilprin.  
"The representation of Strata, as imposed one upon the other, by means of cardboard is certainly a good plan, for apart from rendering more intelligible the general expressions of the Map, it permits of ready alteration and the possibility of constantly bringing the map up to date, in other words to make it conform to more recent discoveries."
- Boston Society of Natural History. Professor Alpheus Hyatt.  
"Your map representing superposition and the various phenomena of geological science, so far as the distribution of rocks on this continent is concerned, has greatly interested me. I think that in the hands of a good teacher it would prove an efficient and useful adjunct in the teaching of geology."
- American Museum of Natural History. Professor R. P. Whitfield.  
"In the direction of a want long felt by Teachers of Geology and will undoubtedly be appreciated by them as well as by the student."
- U. S. Geological Survey. Major J. W. Powell, Director.  
"After examination I am able to state that the work has been executed with care and fidelity, and I believe it will be a valuable aid to teachers."
- New York State Survey. Professor James Hall, State Geologist.  
"I believe that maps constructed upon this method would be extremely useful in the hands of competent teachers."
- Pennsylvania Survey. Professor J. P. Lesley, State Geologist.  
"A piece of new and useful apparatus for teaching Geology, by representing to the eye of the student the areas of superimposed formations. I cordially recommend it to teachers and students."
- New Jersey Survey. Professor Geo. H. Cook, State Geologist.  
"It is very neatly done and must prove a great help to intelligent teaching and studying of Geological Science."

**N. D. C. HODGES, 47 Lafayette Place, New York, N. Y.**

— E. & F. N. Spon announce as in preparation "The Engineers' Sketch-Book of Mechanical Movements, Devices, Appliances, Contrivances, Details, etc.," by T. W. Barber; "Public Institutions; their Engineering, Sanitary, and other Appliances, with the Construction of Special Departments," by F. Colyer; "Practical Gold Mining," a comprehensive treatise on the origin and occurrence of gold-bearing gravels, rocks, and ores, and the methods by which the gold is extracted, by C. G. W. Lock; and "Egyptian Irrigation," by W. Willcocks.

— The Baker & Taylor Company announce for early publication, "The Drill-Master in German, based on Systematic Gradation and Steady Repetition," by Solomon Deutsch, Ph.D., author of "Letters for Self-Instruction in German," etc. This work the author claims to be an application of the principle of presenting but one difficulty at a time, and illustrating and explaining it so fully and by such numerous examples that it has ceased to be a difficulty before another step is taken. It is sought less to give grammatical instruction than to cause the language itself to be so learned that the student without a thought of grammar would never use it except in a grammatical manner. They also announce a "Genealogy of the Farnham Family," by J. M. W. Farnham.

— A. S. Barnes & Co. will publish at once Ex-United States Minister Theodore S. Fay's long-promised work, "The Three Germanies." Dr. Philip Schaff, who read the work in manuscript, says of it, "Few men have had better opportunities to study the history of Germany than Theodore S. Fay, who for twenty-five years occupied diplomatic positions in the service of the United States at Berlin, London, and Berne, and has been residing near Berlin since his retirement from public life. He was an eye-witness of the important events of 1848, 1866, and 1870. His personal experience and long observation give a fresh and life-like character to his interesting work on 'The Three Germanies,' especially the greater part of the second volume from the reign of King Frederick William III., to the death of Emperor Frederick III. in June, 1888."

— The Worthington Company have ready a large-paper edition (limited to 500 copies) of David M. Main's "Treasury of English Sonnets."

— Mrs. Humphry Ward has given up her visit to this country.

— An outcome of Professor J. P. Mahaffy's tour of Greece will be a book on the monasteries of that country.

— Margaret Deland's new novel will be entitled "Sidney Page." Though not dealing directly with theology, it will have a religious motive.

— The Duke of Argyll has written a new work, entitled "What is Truth?" in which the question is considered from a scientific as well as from a theological point of view.

— Marion Crawford's "With the Immortals" is being translated into French, and Rénan will contribute a preface. The French Academy has awarded to Mr. Crawford a prize of two hundred dollars for his two novels written by himself in French, and entitled "Zoroastre" and "Le Crucifix de Marzio."

— Mr. Joseph Thomson, the author of "Through Masai-Land," and as an African traveller second only to Stanley, has just written a book on his recent explorations, "Travels in the Atlas and Southern Morocco," which will be published immediately in New York by Longmans, Green, & Co. It will contain six maps and more than sixty illustrations.

— Alfred R. Conkling of New York, the nephew of Roscoe Conkling, generally known as Alderman Conkling, has about completed the work of collecting material for his life of his uncle, and has a portion of the book already written. He expects to have the entire work ready for the press in October. The publishers will be Charles L. Webster & Co.

— D. C. Heath & Co. have become the American publishers of the Isaac Pitman's shorthand books. They will shortly publish De Garmo's "Essentials of Method." The function of the book is to discover, through "an analysis of the mental activities involved in knowing, what are the essential elements of good method in teach-

ing." It is accompanied by practical illustrations showing "the application of the general laws of right method to all the branches of the common school curriculum."

— The Long Island Historical Society will soon print, for subscribers, about one hundred and fifty unpublished letters of Washington, from its manuscript collections, in a large and handsome octavo volume, entitled "George Washington and Mount Vernon." It will contain a portrait of Washington, not heretofore engraved, from an original painting by Charles Peale (1787), owned by the Rev. Mason Gallagher of Brooklyn; also a portrait of Betty Lewis, Washington's only sister. The historical introduction and annotations will be prepared by Mr. Moncure D. Conway, biographer of Edmund Randolph.

— L. Prang & Co. have published a little booklet containing illustrations in color of the mayflower and the golden-rod, with charming verses by Hopewell Goodwin, in which each flower sets forth its own merits to the choice for America's national flower. Its object is chiefly to decide which of the two is considered the most popular flower, and which therefore might be considered the national flower of America. To ascertain the respective popularity of these and our other American flowers, and thereby hasten, if possible, a solution of the question, the above little work is published. A postal-card accompanies each book, on which the purchaser is requested to fill out, with full address, his choice, and return it. The result, as it appears from time to time, will be published in the daily papers in different parts of the country, and on Jan. 1, 1890, L. Prang & Co. will mail to every voter the final decision.

— A. C. Armstrong & Son are preparing "The Complete Works of William Wordsworth." They are to be known as the "New Handy Volume Red Line Edition," and will be issued in eight volumes.

— George Brumder, 286 Water Street, Milwaukee, Wis., has just ready the first part of a work on "North American Birds." No efforts have been spared to make this one of the most excellent works on the subject. The colored plates are made after the original water-color paintings by Professor Robert Ridgway of the Smithsonian Institution, Professor A. Goering of Leipzig, and Gustav Muetzel of Berlin. The firm which produced these originals in a highly finished style, Ernst Kaufmann, in Lahr, Germany, and New York, is well known in art-circles for its specialty, chromo-work. Mr. Nehrling is an original writer, not simply a compiler. He has observed the life of our birds in the woods of Wisconsin, where he was born, in the prairies of Illinois, in Florida, Texas, Missouri, and many other States. The work will be in twelve parts, of forty to forty-eight pages reading-matter, and three colored plates, and will be completed in the fall of 1890.

— Swan, Sonnenschein, & Co. have published the collection of early letters of Jane Welsh Carlyle, edited by Mr. D. G. Ritchie. In addition to those of Mrs. Carlyle, the volume includes eleven unpublished letters of Carlyle, dealing chiefly with his studies in connection with the projected history of German literature and his "Cromwell."

— Ginn & Co. announce in the College Series of Latin Authors, Cicero's "Brutus," edited by Martin Kellogg. In the "Brutus" which was composed in 46 B.C., and purports to be a conversation with Atticus and Brutus, Cicero traces the development of oratory among the Romans down to his own time, with critical notices of about two hundred speakers. The long catalogue is relieved of dryness by the dialogue form, the freedom of digression, and by Cicero's fresh and teeming style. Professor Kellogg has edited the work especially for early college-reading. The introduction touches upon points of interest to those to whom Cicero is no stranger, and contains a full conspectus. The notes deal with the subject-matter, historical relations, and diction of the dialogue rather than with the commonplaces of grammar. Parallel passages are freely given, especially from Cicero's other rhetorical works and from Quintilian. The book is believed to be a substantial addition to the apparatus for the intelligent study of one of the most characteristic and valuable works in Latin literature.

— *The Political Science Quarterly* for June, 1889, opens with a study of "Municipal Government in Great Britain," by Albert Shaw of the *Minneapolis Tribune*. The article is based on prolonged and direct investigation, and goes behind the legal institutions to show their actual working. J. Hampden Dougherty describes the movements of the last forty years for amendment of the New York State Constitution, discussing especially the various projects for the reform of our city government. Frederick W. Whitridge writes on "Rotation in Office," advocating a repeal of the four years' law, which he regards as the basis of the spoils system. E. P. Cheyney of Pennsylvania University criticises from a social and economic point of view the decisions of the American courts on conspiracy and boycott cases. Professor J. W. Jenks of Knox College, Illinois, gives a history of the whiskey trust, and its effect on prices. The number contains the usual reviews, by specialists, of recent economic and political literature, and a record of political events continued from the last record published in the *New Princeton Review*.

## LETTERS TO THE EDITOR.

## A New Chemical Experiment

(which it would not be well to repeat very often).

LATELY, in my lecture to my class on phosphorus and its compounds, I made hydric phosphide in the usual way, by boiling phosphorus in a strong solution of potassic hydrate. That the class might see that phosphorus melted in an alkaline solution would remain in a liquid state after the solution had cooled, I left the pint flask containing the solution *in statu quo* until the next recitation. I had done the same repeatedly, but never before leaving it for so long a time as on this occasion, — from Friday until Monday. On entering the lecture-room on Monday morning, I observed the flask, and remarked, "All right, the phosphorus is still in a liquid condition;" and, mechanically taking up the flask, I gave it a slight shake, when it immediately exploded with a loud report, shattering the flask into minute fragments, and scattering its contents in every direction; the phosphorus, fortunately, instantly solidifying. So, save a slight cut on the wrist, I escaped without injury. It would be interesting to know if any one else ever experienced a like explosion, and the probable explanation of the explosion. A possible explanation is, that the gas had by adhesion become condensed around the phosphorus as the solution cooled, and that, the slight shake overcoming the adhesion, there was a rapid evolution of the gas. It would not be advisable to repeat the experiment without the face and hands and clothing were well protected. In this connection I would urge that it would be well if chemists, on noticing any like dangerous phenomena not laid down in the text-books, would publish the fact for the benefit of the brotherhood, to prevent serious accidents.

I well remember how near I came meeting with a serious accident from the explosion of a large piece of sodium thrown upon water; the old text-books, written when the price of sodium was as great as for potassium, thus rendering the former too expensive to use except in very small quantities, stating that sodium would not take fire like potassium. The explosion of sodium has resulted in the devising of that most brilliant of all chemical experiments, the ice-volcano.

It is not, perhaps, generally known that iodide of nitrogen, if left standing in aqua ammonia for twenty-four hours, will explode while wet; and even when freshly prepared, if partially dried and then scattered over the surface of a tank of water, it will for hours after

repeatedly explode on slightly agitating the water. Many years ago I devised a method of exploding with safety a mixture of phosphorus and potassic chlorate, which I give for the benefit of the young experimenter. Place powdered potassic chlorate (no more than will cover a nickel, if exploded within doors) upon a board, and wet it with a solution of phosphorus in carbon disulphide (an inch of phosphorus will dissolve in an ounce and a half of carbon disulphide in a few minutes). In from five to ten minutes, or as soon as the mixture is dry, touch it with a long pole, or even stamp heavily on the floor, and a loud explosion will result.

A quantity sufficient to cover a dollar out in the air will shatter a thick plank, and make considerable of a hole in the ground. I have never experimented with large quantities, but presume that rocks might be thus shattered.

J. R. EATON.

Liberty, Mo., June 1.

## Relative Frequency of Letters and Combinations.

IN a recent number of the *Phonographic World* a correspondent asks, "In English composition, (1) what is the relative frequency of the occurrence of the various letters of the alphabet; (2) in what proportion does each letter precede and follow each other letter of the alphabet; and (3) what syllables occur the most?"

In answer to the first question, it may be stated that in a font of type for printer's use, as supplied by type-founders, the different letters are usually supplied in about the following proportion: *e*, 1,200; *i*, 900; *z*, 865; *a*, 850; *n*, *o*, and *s*, 800 each; *h*, 640; *r*, 620; *f*, 450; *d*, 440; *l*, 400; *u*, 340; *c* and *m*, 300 each; *w* and *y*, 200 each; *g* and *p*, 170 each; *b*, 160; *v*, 120; *k*, 80; *q*, 50; *j* and *x*, 40 each; *z*, 20.

Some years ago I undertook to analyze 10,000 words of everyday English, from the editorial columns of twenty leading dailies, 500 words from each, selected from articles in which no undue prominence appeared to be given to any particular word. My object was to ascertain what combinations of two or more letters occurred with greatest frequency. My eyesight failed before my task was half completed; but the result of my labors, as far as they went, may be of interest in connection with the foregoing questions. In 3,500 words, as far as my analysis extended, I found that two-letter combinations occurred as follows: —

Times.	Times.	Times.	Times.
th..... 605	is..... 175	as..... 111	me..... 89
in..... 314	at..... 173	it..... 111	ma..... 88
an..... 312	of..... 153	al..... 110	co..... 85
of..... 236	es..... 128	he..... 94	be..... 77
re..... 232	se..... 121	ha..... 93	le..... 77
er..... 227	ed..... 120	ve..... 92	pr..... 72
on..... 226	to..... 120	de..... 91	la..... 71
en..... 186	ar..... 117	ou..... 90	ll..... 70

This, of course, does not answer the questions asked, but the material furnished may be of some assistance to the inquirer, should he wish to pursue the subject further.

It may be added, that, in the number of words mentioned, the word *the* occurred 250 times; *of*, 180 times; *and*, 144 times; *to*, 79 times; and *in*, 74 times. 918 words occurred only once each, 163 twice, and 65 three times. The three-letter combination *the* (in *there*, *them*, etc., as well as alone) occurred 400 times; *and*, 172 times; *ing*, 114 times.

A very suggestive point to type-writer manufacturers and inventors is the fact that in all these words the letter *z* occurred but 8 times, while *th* occurred 605 times, and *the*, 400 times.

H. J. T.

New York, June 4.

## INDUSTRIAL NOTES.

## A New Photographic Lens.

THE Messrs. Beck have just turned out of their factory, and Morris Earle & Co., 1016 Chestnut Street, Philadelphia, have received from them, a new combination of their excellent lenses whereby one Iris diaphragm tube is adapted to carry three different sets of lenses, so that a photographer can take  $4 \times 5$ ,  $4\frac{1}{2} \times 6\frac{1}{2}$ , and  $5 \times 8$  views by means of adapting the three sets of lenses. Messrs. Earle & Co. have also recently received a new four-inch

rectilinear, with Iris diaphragm, from the same firm, — the smallest lens they have ever turned out for photographers' purposes. This is meant to take lantern-slide negatives particularly, and is one of the finest lenses ever received from them.

## A Beautiful Portfolio of Paintings in Water Colors.

The manufacturers of the well-known Scott's emulsion of cod-liver-oil are issuing the most beautiful portfolio of eight artistic studies (birds and flowers) that has ever come under our notice. This work is worth at least two dollars, but Messrs. Scott & Bowne, with their usual enterprise, have made arrangements